

CLAIMS

1. Method for reception of a signal modulated according to a main constellation, called the main signal, and at least one signal modulated according to a secondary constellation, called the secondary signal, said secondary constellation being included in said main constellation,
 - 5 said method comprising a demodulation step of said main signal, outputting a confidence bit for each of the elements in the main constellation, related to reception of said element, called the main confidence bit, characterised in that it comprises a step to determine at least one confidence bit related to reception of at least one element of said secondary constellation, called a secondary confidence bit, using at least one of said main confidence bits,
 - 10 so as to demodulate the secondary signal.
 - 15 2. Reception method set forth in claim 1, characterised in that said element is one of the bits transmitted by a symbol of said main and / or secondary constellation.
 - 20 3. Reception method set forth in claim 2, characterised in that said main confidence bit is a hard reception decision of said bit in said main signal.
 - 25 4. Reception method set forth in claim 3, characterised in that it comprises a prior step to determine the log likelihood ratio (LLR) of said bit called "soft bit", for at least some of said bits of said main signal, using said associated hard decision.
 5. Reception method set forth in claim 4, characterised in that said prior determination step uses a criterion belonging to the group comprising:
 - the Lop-Map criterion;
 - the Max-Log-Map criterion;
 - the SOVA (Soft-Output Viterbi Algorithm based on the maximum likelihood criterion for detection of the most probable sequence),and / or an approximation of one of these criteria.

6. Reception method set forth in claim 2, characterised in that said main and / or secondary confidence bit associated with a bit is a log likelihood ratio (LLR) of said bit, called the main and / or secondary soft bit.

7. Reception method set forth in claim 6, characterised in that said step to
5 determine said secondary confidence bit comprises the following sub-steps:

- said secondary "soft bits" are expressed as a function of a posteriori probabilities of symbols in said secondary constellation, said symbols in said secondary constellation also belonging to said main constellation, so as to obtain a first expression;

10 - the a posteriori probabilities of bits in said main constellation are expressed as a function of the a posteriori probabilities of symbols in said main constellation, bringing out the soft bits of said main constellation, output during said demodulation step of said main signal so as to obtain a second expression.

8. Reception method set forth in claim 7, characterised in that it also
15 comprises a sub-step for mathematical simplification of said first expression, using a saturated linear approximation or a piecewise linear approximation.

9. Reception method set forth in any of claims 7 and 8, characterised in
that it also comprises a sub-step to classify symbols in said main constellation so
as to minimise the number of soft bits in said main constellation used during the
20 calculation of soft bits in said secondary constellation.

10. Reception method set forth in claim 1, characterised in that the element
is a symbol in said main and / or secondary constellation.

11. Reception method set forth in claim 10, characterised in that said main
and / or secondary confidence bit associated with a symbol is an a posteriori
25 probability of a symbol in said main and / or secondary constellation.

12. Reception method set forth in claim 11, characterised in that during
said demodulation step of said main signal, said main confidence bits are
preferably calculated using one of the detection algorithms belonging to the group
comprising:

30 - the Max-Log-Map;
- the Log-Map;

- SOVA (Soft-Output Viterbi Algorithm based on the maximum likelihood criterion for detection of the most probable sequence);
 - DDFSE (Delayed Decision Feedback Sequence Estimation);
 - RSSE (Reduced-State Sequence Estimation);
 - 5 - M-algorithm;
 - T-algorithm.
13. Reception method set forth in claim 12, characterised in that said detection algorithm being two-directional, said secondary confidence bits associated with the symbols in said secondary constellation are secondary soft bits corresponding to the log likelihood ratio (LLR) values of said bits of said symbols, and are determined by the following sub-steps:
- select a sub-set of a posteriori probabilities of symbols in said secondary constellation among the set of a posteriori probabilities of available symbols in said main constellation;
 - 15 - determine said secondary soft bits as a function of said sub-set of a posteriori probabilities of symbols in said secondary constellation, said symbols in said secondary constellation also belonging to said main constellation.
14. Reception method set forth in claim 13, characterised in that said prior determination sub-step uses a criterion belonging to the following group:
- 20 - the Log-Map criterion;
 - the Max-Log-Map criterion;
 - SOVA (Soft-Output Viterbi Algorithm based on the maximum likelihood criterion for detection of the most probable sequence),
and / or approximation of one of these criteria.
- 25 15. Reception method set forth in claim 12, characterised in that since said detection algorithm is single-directional, said secondary confidence bits associated with symbols in said secondary constellation are secondary soft bits corresponding to the log likelihood ratio (LLR) values of said bits of said symbols, and are determined by the following sub-steps:

- select a sub-set of a posteriori probabilities of symbols in said secondary constellation among the set of a posteriori probabilities of available symbols in said main constellation;
 - determine said secondary soft bits as a function of the sub-set of a posteriori probabilities of symbols in said secondary constellation, said symbols in said secondary constellation also belonging to said main constellation;
 - determine the sign of secondary soft bits as a function of the value of bits of symbols in said main constellation.
16. Reception method as claimed in any of claims 1 to 15, characterised in that said main and / or secondary constellations belong to the group comprising:
- M-QAM modulations, where $M = 2^m$;
 - N-PSK modulations, where $N = 2^n$;
 - the linearised GMSK or MSK modulation.
17. Receiver of a modulated signal according to a main constellation, called the main signal, and at least one modulated signal according to a secondary constellation, called the secondary signal, said secondary constellation being included in said main constellation,
- 20 said receiver comprising means of demodulating said main signal outputting a confidence bit related to reception of each element in the main constellation, called the main confidence bit,
- characterised in that it comprises means of determining at least one confidence bit related to reception of at least one element in said secondary constellation, called the secondary confidence bit, using at least one of said main confidence bits,
- 25 so as to demodulate the secondary signal.
18. Receiver set forth in claim 17, characterised in that this receiver is of the type belonging to the group comprising:
- GSM receivers;
 - GPRS receivers;
 - EDGE receivers.

19. Receiver set forth in either of claims 17 and 18, characterised in that said element is one of the bits transmitted by a symbol in said main and / or secondary constellation.
20. Receiver set forth in claim 19, characterised in that said main confidence bit is a hard decision for reception of said bit in said main signal, and in that it comprises prior means to determine the log likelihood ratio (LLR) of said bit called a "soft bit", for at least some of said bits of said main signal, using said associated hard decision.
21. Receiver set forth in claim 20, characterised in that said prior means to determine the log likelihood ratio (LLR) use a criterion belonging to the group comprising:
- the Lop-Map criterion;
 - the Max-Log-Map criterion;
 - the SOVA (Soft-Output Viterbi Algorithm based on the maximum likelihood criterion for detection of the most probable sequence);
- and / or approximation of one of these criteria.
22. Receiver set forth in any of claims 17 and 18, characterised in that the main and / or secondary confidence bit associated with a bit is a log likelihood ratio (LLR) of said bit, called the main and / or secondary soft bit, and in that said means to determine said secondary confidence bit comprise additional means:
- to express the secondary "soft bits" as a function of a posteriori probabilities of symbols in said secondary constellation, said symbols in said secondary constellation also belonging to said main constellation, so as to obtain a first expression;
 - to express a posteriori probabilities of bits in said main constellation as a function of the a posteriori probabilities of symbols in said main constellation, bringing out the soft bits in said main constellation, output during said demodulation step of said main signal so as to obtain a second expression.
23. Receiver set forth in claim 17, characterised in that said element is a symbol in said main and / or secondary constellation.

24. Receiver set forth in claim 23, characterised in that said main and / or secondary confidence bit associated with a symbol is an a posteriori probability of a symbol in said main and / or secondary constellation, and in that said means for demodulating said main signal use one of the detection algorithms belonging to
- 5 the group comprising to calculate said main confidence bits:
- the Max-Log-Map;
 - the Log-Map;
 - SOVA (Soft-Output Viterbi Algorithm based on the maximum likelihood criterion for detection of a most probable sequence);
- 10 - DDFSE (Delayed Decision Feedback Sequence Estimation);
- RSSE (Reduced-State Sequence Estimation);
- M-algorithm;
- T-algorithm;
to calculate said main confidence bits.
- 15 25. Receiver as set forth in any of claims 17 to 24, characterised in that said main and / or secondary constellations belong the group comprising:
- M-QAM modulations, where $M = 2^m$;
- N-PSK modulations, where $N = 2^n$;
- the linearised GMSK or MSK modulation.